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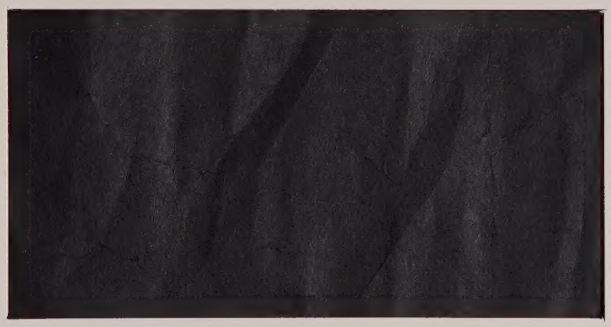

RECORDER MANUAL

MP MASTER
MA35982

gulton®

OPERATION and SERVICE MANUAL

TSC-922

Signal Conditioner

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East Greenwich, RI 02818
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MODEL TSC-922 SIGNAL CONDITIONER

DESCRIPTION

1.1 GENERAL DESCRIPTION

The TSC-922 Signal Conditioner is a plug-in module for use in Gulton's 4, 6, and 8 Channel Portable Recorders. This Signal Conditioner has a true differential input with a maximum sensitivity of 10 uv/chart division. It features fixed-range, zero-suppress with calibrated dial for expanded-scale recording of AC signals riding on DC levels.

1.2 SPECIFICATIONS: GENERAL

The TSC-922 Signal Conditioner is designated to operate on either of two Gain ranges, identified as a High-Gain Mode and Low-Gain Mode. Selection of the Gain Mode is governed by the Gain Mode Switch, (the red knob concentric with the Attenuator Switch). The only operational difference between the two Gain ranges, (other than sensitivity) is the zero-suppress scale factor. Using the High-Gain Mode, the zero-suppress ranges are -10 and -100 Millivolts, full scale; with the Low-Gain Mode, the ranges are -10 and -100 Volts, full scale.

FOR DETAILED SPECIFICATIONS

SEE TABLES ON FOLLOWING PAGES

1.2-1 SPECIFICATIONS - TABLE A

ITEM	SPECIFICATIONS COMMON TO BOTH HIGH & LOW GAIN MODE	
Input Configuration	Differential, balanced to Floating Shield	
Input Impedance	1 Megohm to each Input to Floating Shield	
Calibration	Internal ±1% (100 mv injected at input when in CAL pos.) Adjust GAIN for 20 Div. to give 1% system calibration.	
Span Control	Allows ±10% adjustment of DC excitation voltage	
DC Excitation	+5, +10 and +12 Volts, selected by internal Jumper placement	
DC Excitation Stability	Line Regulation, 0.1% 105-135 VRMS Load Regulation, 1% 1 to 50 ma Ripple, 1 mv maximum Temperature, 0.5% / 10°C maximum Current Limit, 65 ma typical	
Gain Control	Range: 10 through 110% of Calibrated Gain (Screw-driver control)	
Stylus Position Control	Range: ± full scale with 0 signal input	
Frequency Response (limited by the Recorder in which Sig. Conditioner is used)	DC - 35 Hz, 50 Div P/P 1 db. DC - 50 Hz, 20 Div P/P 1 db. DC - 100 Hz, 8 Div P/P 3 db.	Typical of Gulton's Portable Recorders
Noise	1 Div. maximum with 350 Ohms across input at maximum calibrated sensitivity	
Gain Mode Switch	Concentric with Attenuator Switch; 4 positions, namely, "OFF", "CAL", mv/Div." and "μv/Div."	
Zero Drift	1 Div./3°C maximum, at Max. Calibrated Sensitivity 1 Div. 8 hours - constant ambient temperature	
Gain Stability	1/2% / 10°C., 1/2% 105-135 VRMS	
Environmental Tolerances	Operating Temperature Range: 0 to 45°C. Max. Vibration Tolerance: 2 g's, 2 to 100 HZ	

1.2-2 SPECIFICATIONS - TABLE B

ITEM	Specifications Differing According to Gain Mode	
	HIGH GAIN ONLY (μv/DIV)	LOW GAIN ONLY (mv/DIV)
Sensitivity, Basic	10 μv/ Division	10 mv / Division
Attenuator Positions	10, 20, 50, 100, 200, 500, 1000 μv / div.	10, 20, 50, 100, 200, 500, 1000 mv / div.
Common Mode Voltage	±7.5 Volts DC Max., Fuse protected at ± 25 Volts	300 Volts DC Max. (between signal inputs & common)
Common Mode Rejection	60 db Min., DC to 200 Hz	60 db Min.
Zero Suppression	2 ranges, independent of attenuator pos. ±100 mv and ±10 mv, front panel SW and 10-turn calibrated pot., Resolution ±0.1% Accuracy, ±2% of F. S.	2 ranges: ± 100 Volts and ± 10 Volts

INSTALLATION

2.1 MECHANICAL INSTALLATION

Assembling the TSC-922 Module to the Recorder Frame

The entire Signal Conditioner Module is merely inserted into the appropriate space provided within the Recorder Frame. To make the insertion, hold Module with top and bottom edges of the Printed Circuit Board () aligned with the Guide-Slots in the Recorder.

Apply pressure to the left-hand edge of the Module Front Panel and press firmly inward until face of Module Panel is flush with face of Recorder. Final seating pressure may be applied to the Module knob-handles.

After Module if fully seated, the Module is firmly secured mechanically, to the Recorder Main Frame. In addition, the necessary internal electrical connections are established so that the Signal Conditioner/Recorder unit is ready for operation as soon as it is properly connected to its source, as explained in the following "Electrical Installation" instructions.

2.2 ELECTRICAL INSTALLATION

Information in this sub-section tells how to connect the Signal Input Cable to the Signal Conditioner/Recorder unit; also how to connect Internal Bridge-Completion Resistors, (when required).

2.2.1 PRELIMINARY INFORMATION

The signal-source input is conveyed to the Signal Conditioner/Recorder unit via a suitable shielded-type cable.

To provide for the ready interchange of input sources, a plug-in arrangement is used for connecting the Input Cable to the Signal Conditioner/Recorder assembly.

The Input Connector Plug, (assembled to end of Cable) inserts into a mating Receptacle located on top or rear panel of the Recorder frame.

The only electrical wiring required in the field, to install the Signal Conditioner, is connection of the Input Signal Cable.

2.2-2 SIGNAL INPUT CABLE, DESCRIPTION

The required Cable (to be procured by customer) is a standard, 2, or 3 conductor (depending on application) shielded type, of adequate length to reach between signal-source equipment and the Recorder Receptacle. Cable must be of good instrumentation grade.

2.2-3 INPUT CONNECTOR PLUG, DESCRIPTION

This Plug is a standard audio type, made by SWITCHCRAFT (P/N-14FL5F). A Connector Plug, or set of Plugs (1 for each channel) is supplied with each Recorder. Additional Plugs, if required, are readily obtainable from most electronic parts distributors.

Design of the Plug is indicated in Figure 2-4. As seen in Figure 2-4C, the Plug has 5 Pins, numbered 1 through 5, reading clockwise from the Keyway. These numbers are molded onto the end of Plug Insert.

The Input Connector Plug Pins have various functions, as follows:

Pin No.	Pin Function
1	Non-Inverting (Sig. +)
2	Inverting (Sig. -)
3	Common Shield

2.2-4 ALTERNATIVE WIRING PLANS FOR SIGNAL INPUT CONNECTIONS

General Explanation
The signal source is connected to the Signal Conditioner in various ways, depending on source characteristics.

Figures 2-5 through 2-8 show connections for various source configurations.

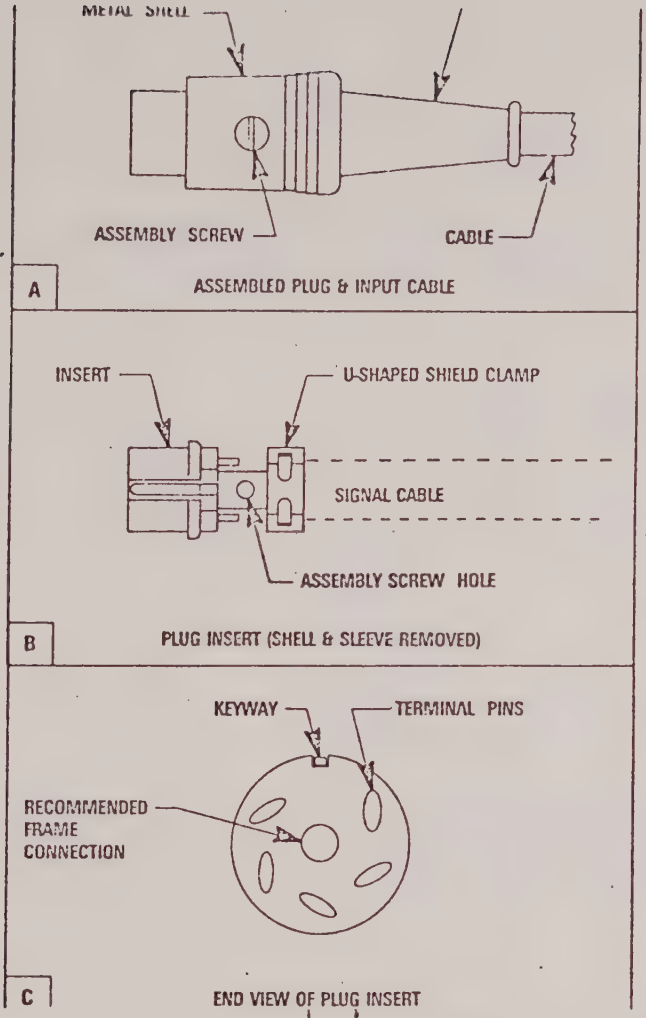
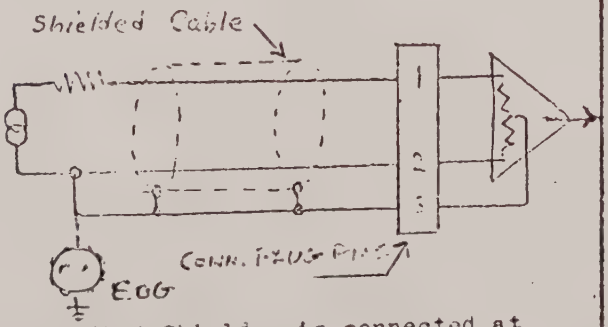


FIGURE 2-5 WIRING DIAGRAM

Limited to: Voltage Mode recording from single-ended, "floating" source



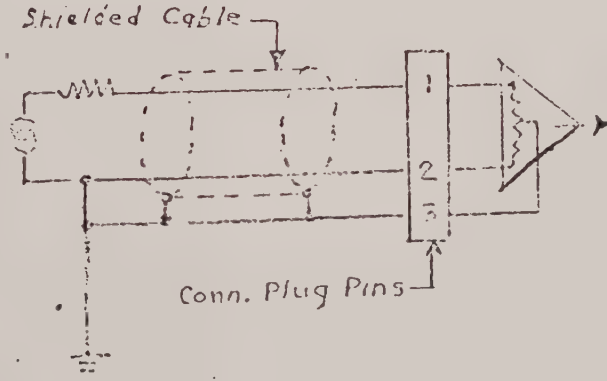
Note that Shield is connected at both ends.

The off-ground voltage on which the signal is riding must not exceed 125 VRMS (when recording from off-ground sources).

The connections to Pins 1 and 2 can be reversed if a change in polarity is desired.

FIGURE 2-6 WIRING DIAGRAM

Limited to: Voltage Mode recording from Single-Ended Grounded Source

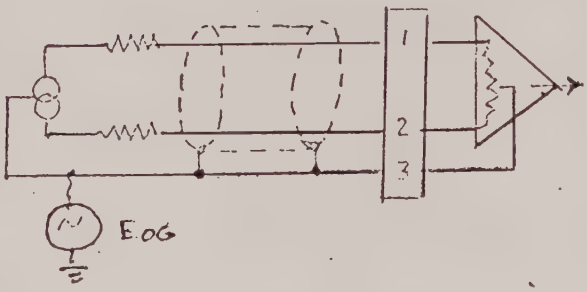


Note that Shield is connected at both ends.

Connections to Pins 1 and 2 can be reversed if a change in polarity is desired.

FIGURE 2-7 WIRING DIAGRAM

Limited to: Voltage Mode recording from Balanced "Floating" Signal Source



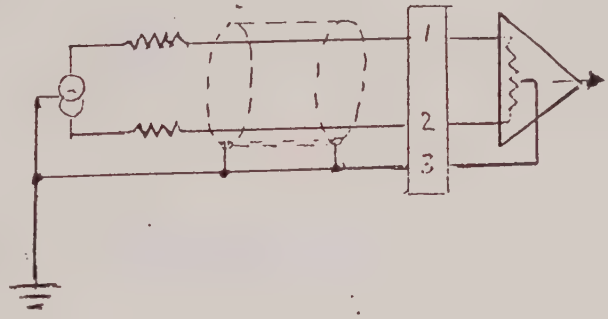
Note that Shield is connected at both ends.

The Common Mode Voltage (Voltage between Pins 2 & 3 or 1 & 3) must not exceed 7.5 Volts DC in the High-Gain Mode or 300 Volts in the Low-Gain Mode.

The Off-Ground Voltage (EOG) must not exceed 125 VRMS.

FIGURE 2-8 WIRING DIAGRAM

Limited to: Voltage Mode recording from Balanced-to-Ground Source



Note that Shield is connected at both ends.

The Common Mode Voltage (Voltage between Pins 2 & 3 or 1 & 3) must not exceed 7.5 Volts DC in the High-Gain Mode or 300 Volts in the Low-Gain Mode.

OPERATING PROCEDURE

3.1 Initial Control Settings

(1) Set Controls as follows:

Zero Suppress Switch	OFF
Gain Mode Switch	OFF
Attenuator Switch	1000

(2) Disconnect the Input Conn. Plug.

(3) Turn ON Recorder Main Power Switch with the Chart Drive OFF. Allow Recorder and Signal Conditioner to warm up for 5 minutes, minimum.

(4) Set Chart Speed for 0.5 mm/second.

3.2 Zero Base Line Set-Up

(1) Decide where the Zero Baseline is best positioned. For normal operation, where + and - signals will be recorded, the base line is best set at center scale. If only Pos. or Neg. signals are to be recorded, left or right chart margin, respectively, would be the choice.

(2) Having decided where zero baseline is to be, unlock and turn the Position Control to set Stylus to the desired baseline position, then lock the Position Control.

3.3 Gain Calibration
After completing 3.2

(1) Turn Gain Mode Switch to the CAL position, and

(2) Adjust Gain Control Pot for 20 div. deflection from the zero baseline. NOTE: if the zero baseline has been set at the right - hand margin, it will be necessary before making the Gain Calibration to shift baseline to chart center, and then return it to right-hand setting after Gain Calibration is complete.

3.4 Offset Voltage Check
After Gain is properly calibrated

(1) Return Gain Mode Switch to the OFF position and recheck the zero baseline position.

(2) Place Gain Mode Switch in the MV/DIV position and advance the Attenuator Switch from 1000 to 10.

The Stylus should remain within one division of the zero baseline. If not, adjust.

(3) Adjust the V_o Control (accessible through the front panel) to reposition the Stylus to the zero baseline.

(4) Return Gain Mode Switch to OFF and Attenuator Switch to 1000.

3.5 Recording the Signal - Initial Procedure

(1) Connect input signal to the Recorder

(2) Turn Chart Drive on

(3) Set the Gain Mode and Attenuator Switches according to the dictates of the input signal amplitude.

3.6 Recording the Signal - Secondary Procedure If Required (to correct non-symmetrical stylus trace)

Certain input signals-with both AC and DC components- may cause the Stylus to swing further to one side of the pre-set zero baseline than to the other. If so, one of two corrective measures will be required, namely:

3.6-1 Position Control Re-Adjustment

Provided the DC offset is not greater than 50% of the F.S. range (at the existing Attenuator setting), the Stylus Position Control can be

3.6-1 re-adjusted to establish a new zero baseline and obtain a symmetrical Stylus sweep.

OR

3.6-2 Zero Suppression Operation

If the above Position Control Re-adjustment is impracticable, Zero Suppression can be used to offset DC signals up to 100 Volts. Typically, Zero Suppression allows a more sensitive Range Switch setting when large DC signals are present, while at the same time allowing measurement of the total signal amplitude.

Proceed as follows:

(1) First, without using Zero Suppression, record the signal to be investigated and note the approximate peak-to-peak amplitude of the AC as well as DC signal components. Best results are obtained using a margin zero, that is, by initially setting the baseline trace at the left or right-hand margin of its channel (left, if DC component is positive; right, if negative). To set this "zero", use the Position Control, while the Function Switch is in OFF position.
DO NOT TOUCH THE POSITION CONTROL THEREAFTER, as all readings will be taken from this initial "zero".

(2) Setting the Suppression Controls

In the mv/DIV Gain Mode, the Zero Suppress ranges are -10 and -100 mv., which are selectable by the Zero Suppress Function Switch.

In the mv/DIV Gain Mode, the Suppress ranges are -10 and -100 Volts.

A precise setting of any voltage within these ranges is made by means of the 10-turn Calibrated-Dial Suppress Potentiometer.

Example:

To suppress a 71 mv DC signal, the High-Gain Mode (uv/DIV) would be selected, and the Suppress Function Switch placed in the -100 position (-100 mv full scale suppression capability). The 10-turn Calibrated Dial would then be set to 71.

(3) Recording the Signal

Turn the Attenuator Switch to a sensitivity which allows the AC signal component to stay on scale. A minor adjustment of the Zero Suppress Pot may be needed to keep the trace on scale.

To determine the total signal amplitude, simply read the voltage off the chart (number of DIV. deflection from zero baseline times Attenuator setting) and add to this reading the setting of the 10-turn Dial times the suppression range.

MAINTENANCE

4.1 PERIODIC PREVENTIVE MAINTENANCE, GENERAL

Detailed in this Section, under the heading "Preventive Maintenance", are those precodures deemed essential to insure the continuing operation of the TSC-922 Signal Conditioner at peak efficiency.

Under normal-use conditions, the recommended maintenance - both mechanical and electrical - should be performed at six-month intervals. Under severe operating conditions, the program should be repeated every 90 days.

4.2 Preventive Maintnenace, Mechanical

4.2.1 Preliminary

Turn OFF all power.

Remove the Preamplifier from the Recorder by grasping the top and bottom Handle-Knobs and then pulling the entire Preamp Unit straight out.

4.2.2 Cleaning

Using suitable air hose, blow out loose dust and dirt.

Inspect for any foreign particles and remove if present.

Clean the Preamp Panel and Handle-Knobs with a moist cloth, then wipe dry with soft clean cloth.

4.2.3 Tightness Check

Inspect the Preamplifier and Power supply for loose parts, (transistors, plug-in components, resistors, condensers, controls, terminal boards, mounting boards, rectifiers, fuses, transformers, etc.).

Check that all panel-mounted components are securely in place, that all locking controls will lock securely, and that each Control Knob is tight on its shaft.

4.2.4 Damage Check

Inspect visually and by smell for burned or worn insulation, leaking or damaged resistors, condensers, transformers, etc. Inspect also for corrosion, rust, and electrical or mechancial abuse.

4.2.5 Replacement

Reinstall the equipment and fasten securely.

4.3.3 Prepartory

It will be necessary to provide access to various internal adjustments while the Signal Conditioner is connected and operating. To accomplish this, remove Signal Conditioner into the connector on front of the Extender Card.

4.3.4 Initial Set-Up

(1) Turn ON Recorder main power, then set Chart speed to LOWEST setting.

(2) Set the Signal Conditioner Controls as follows:
GAIN MODE - Off
Zero Suppress - Off
Position Control - Center scale, zero baseline

(3) Disconnect the Input Signal Cable

4.3.5 Output Vo Adjustment

(1) Set Gain Mode Switch to OFF

(2) Set GAIN Control Max. CCW

(3) Adjust Position Control for exact center scale Stylus position and lock the Control.

(4) Re-set GAIN Control to Max. CW position.

(5) Adjust Output Vo Pot (R22) to re-set Stylus to exact center scale, as you step down the atten. to 10 scale. (For location of R22 refer to Drawing #403850)

4.3.6 Input Vo Adjustment

After completing Output Vo Adjustment,

(1) Set Gain Mode Switch to MV/DIV

(2) Without touching the Position Control, adjust Input Vo Pot (R12) accessible through Front Panel, for exact center scale Stylus position

(3) Switch back and forth between MV/DIV and OFF, checking to assure there is no offset between OFF and MV/DIV, re-adjusting R12 if necessary.

4.3.7 Internal CAL Voltage Adjustment

(1) Using a variable DC source and a DVM, insert a 20.0 mv signal at the input signal Connector. (For proper connection of signal source, see Figure 2-5, Section 2)

(2) Set operating controls thus:

Gain Mode - uv/DIV
Attenuator - 1000
Zero Suppress - OFF

(3) Adjust Gain Control for exactly 20 DIV deflection from zero baseline. (Check Zero Baseline by switching Mode Switch to OFF position)

(4) Switch Gain Mode to CAL position. Stylus now should be at the same 20 DIV deflection observed in step (3); if not adjust R49 accordingly. (For location of R49, see Drawing #403850)

4.3.8 Zero Suppress Calibration

(1) Set the variable DC source, (connected as in 4.3.7) to -100 mv, using the DVM to measure the input signal

(2) Set the Gain Mode Switch to OFF and adjust the Position Control if necessary for center scale zero baseline

(3) Set: Attenuator to 1000
Zero Suppress to -100
10-Turn Suppress Pot to 10.0
Gain Mode Sw. to uv/DIV

The Stylus should remain at the center zero baseline, (the 100 v input signal being exactly cancelled by the internal suppress voltage).

(4) Step the Attenuator through to maximum sensitivity (10), adjusting R32 as necessary to maintain the Stylus position at center scale. (For location of R32, see Drawing # 403850)

THIS COMPLETES THE RECOMMENDED PREVENTIVE MAINTENANCE PROCEDURE

INDEX TO CONTENTS OF THIS PARTS CATALOG

COMPONENTS COVERED	LOCATION IN CATALOG	
	Plate & List	Page
MODULE ASSEMBLY. This is the complete TSC-822 Signal Conditioner, made up of various individual components plus 2 sub-"assemblies".	1	2 & 3
Note: Each of the sub-assemblies is detailed separately on additional Plates & Lists as noted below.		
PCB PREAMPLIFIER ASSEMBLY.....	2	4 & 5
ATTENUATOR ASSEMBLY.....	3	8 & 9

HOW TO ORDER PARTS

Determine Part Number and Name of each desired component by referring to the appropriate PLATE & LIST. In writing parts orders, it is important always to state the correct PART NUMBER as well as Part Name and quantity wanted, for each item. Also give Signal Conditioner, Model and Serial Numbers.

Price quotations, when requested, will be furnished prior to shipment of any order. Unless otherwise specified by customer, parts orders are shipped _____

Parts List
Pre-Amplifier P.C. Board Assembly No. 403850

Ref. Designation	Part Number	Description	Notes
R72	100549-1004	Resistor ¼WMF 1 MEG Ω	
R7	100549-100R	Resistor 100Ω MF	
	104537	Recepticle	
F1, F2	107465	Fuse 1/100 AMP	
C5	100484-222	Cap. .002 µf	
	104305	Transistor PAO	
	403848	SCHEMATIC	
R32	103654-203	Trimpot 20K	
R49	103654-101	Trimpot 100Ω	
R48	100549-9092	Resistor 90.9K	
R47	100549-150R	Resistor 150Ω	
VR2	110017	Regulator -15V, 79M15UC	
VR1	110016	" +15V, 78M15UC	
R12	103954-103	Trimpot 10K	
PC1	403849	PC Board	
	111010	Heat Sink	
R33	100549-4992	Resistor 49.9K	
R31	100549-4532	Resistor 45.3K	
R30	100549-2492	Resistor 24.9K	
R24, R25	100549-499R	Resistor 499Ω	
R21	100549-4991	Resistor 4.99K	
R13, R34	100549-1002	Resistor 10K	
R22	103954-203	Trimpot 20K	
R8, R9, R10, R11	1-100549-1002	Resistors Matched Pairs 10K	
R67, R68	100549 -1151	Resistor 1.15K MF	
R5, R6	100549-2001	Resistor 2K MF	
C6, 7	107128-106	Capacitor	
CR5	106080-2	Bridge Rectifier	
CR4	104154	Diode Zener	
CR1, CR2, CR3	106696-9.1	Diode Zener 9.1V	
C3, C4	110565-16	Capacitor 1000 µf .40V	
C1, C2	103998-684	Capacitor .68µf	
R69, R70	100549-2002	Resistor 20K MF	
A3, A4, A5	201980	Amplifier Operations AD741K	
A1, A2	1-202062	Amplifier Operational 741L	

TSC-922

PARTS LIST, MODULE P/N 403626

FIND #	PART NUMBER	PART NAME
1	B-402483	Panel Front
2	403850	Assy P.C. Board
3	1-107381-502	Potentiometer, 10 Turn
4	107291	Strap
5	110344	Knob
6	104343	Plug, Banana
7	110795-203	Potentiometer
8	110442	Knob
9	110632	Shaft Lock
10	106736	Switch, Roatry
11	110545	Knob
12	202897	Assy, Attenuator
13	102066	Washer, Ins.
14	110547	Knob, Conc.
15	403854	Schematic
16	100549-1542	Resistor, 1%MF 15.4K
17	100549-1963	Resistor, 1% MF 196K

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Graphic Instruments Division

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MP MASTER

MA35982

For Recorder Manual:

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